

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Application of:

Mountain, et al.

Application No.: 10/716, 695

Filed: November 18, 2003

For: CONTEXT AND CONTENT
SENSITIVE DISTRIBUTED
APPLICATION ACCELERATION
FRAMEWORK

Examiner: ZHE, MENG YAO

Art Unit: 2195

Confirmation No. 6615

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Declaration of Inventor Pursuant to 37 C.F.R. § 1.131

We, Highland Mary Mountain, Krishnamurthy Srinivasan, and Jackson He, hereby declare that:

1. At the time of conceiving and reducing to practice the above identified invention we were citizens of the United States, and Highland Mary Mountain and Krishnamurthy Srinivasan were residing in the State of Arizona and Jackson He was residing in the State of Oregon.
2. We are joint inventors of the subject matter of the above-captioned application, as originally declared on March 29, 2004 by Highland Mary Mountain and Krishnamurthy Srinivasan, and on April 12, 2004 by Jackson He, respectively, in the combined declaration and power of attorney, filed on April 16, 2004.
3. From prior to conception of the invention until after the filing of the above-captioned application, we were employed by Intel Corporation of Santa Clara, California,

the assignee of the above-captioned application.

4. To the best of our recollection and as refreshed by attached **Exhibit I**, the subject invention was conceived at least as early as September 24, 2002. **Exhibit I** is a photocopy of an Inventor Disclosure Form ("IDF") dated September 24, 2002.

5. We additionally declare that we worked diligently with our colleagues in the Intel Legal Department from at least prior to October 28, 2003 (the filing date of U.S. Patent Publication 2005/0091654 filed by Lexion) until the filing date of the above-captioned application on November 18, 2003, to constructively reduce the invention to practice. This work included submitting **Exhibit I** to Intel's relevant technology patent committee for a filing decision and working with Intel patent attorneys to prepare the above-captioned application. The work with Intel patent attorneys in preparing the above-captioned application at least included one or more telephone conferences by one or more of us discussing the invention; reviewing and commenting on one or more draft iterations provided by the patent attorneys; and reviewing and executing necessary paperwork (e.g., assignment, combined declaration and power of attorney), which eventually led to the filing on November 18, 2003.

We further declare that all statements made herein of our own individual knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified patent application or any patent issued thereon.

Executed by and on the date(s) as set forth below:

By: 
Highland Mary Mountain

Date: 2/12/2010

By: _____

Date: _____

Krishnamurthy Srinivasan

By: _____

Date: _____

Jackson He

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By _____

Date _____

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By K. Srinivasan

Date 3/2/2010

Krishnamurthy Srinivasan

By _____

Date _____

Jackson He

Executed by and on the date(s) as set forth below:

By: _____

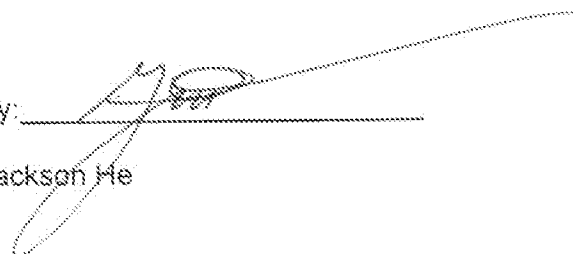
Date: _____

Highland Mary Mountain

By: _____

Date: _____

Krishnamurthy Srinivasan

By:  _____

Date: 02/12/2010

Jackson He

INTEL INVENTION DISCLOSURE
ATTORNEY-CLIENT PRIVILEGED COMMUNICATION
 located at <http://legal.intel.com/patent/index.htm>

27999

DATE: 09/24/2002

INTERNET/CTG/DSL/WST

It is important to provide accurate and detailed information on this form. The information will be used to evaluate your invention for possible filing as a patent application. **Invention Disclosure forms MUST be sent electronically via email to your manager/supervisor who should then forward with their approval to our email account "invention disclosure submission."** If you have any questions, please call **8-264-0444**.

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(PROVIDE SAME INFORMATION AS ABOVE FOR EACH ADDITIONAL INVENTOR)

2. Title of Invention:

An end-to-end context/content-sensitive distributed application acceleration framework.

3. What technology/product/process (code name) does your invention relate to (be specific if you can)

IPP, ETA, AIMM, CIM+, PCA, CC/PP, ACT

4. Include several key words to describe the technology area of the invention in addition to # 3 above:

Web service, performance optimization, manageability, distributed web services solutions, XML, profiles, device profiles, mobile computing

5. Stage of development (i.e. % complete, simulations done, test chips if any, etc.):

EXHIBIT 1

Concept definition: 100%, some early prototypes done.

6a. Has a description of your invention been (or planned to be) published outside of Intel: Yes (in the Spring 2003 IDF)

If YES, was the manuscript submitted for pre-publication approval through the Author Incentive Program:

If YES, please identify the publication and the date published:

6b. Has your invention been used/sold or planned to be used/sold by Intel or others? Yes

If YES, date it was sold or will be sold: Q3 2003

6c. Does this invention relate to technology that is or will be covered by a SIG (special interest group)/standard or specification?
TBD

If YES, name of SIG/standard/specification:

6d. If the invention is embodied in a semiconductor device, actual or anticipated date of tapeout? N/A

6e. If the invention is software, actual or anticipated date of any beta tests outside Intel: Q3 2003

7. Was the invention conceived or constructed in collaboration with anyone other than an Intel blue badge employee or in performance of a project involving entities other than Intel (e.g. government, other companies, universities or consortia)? NO If YES, name of individual or entity:

8. Is this invention related to any other invention disclosure that you have recently submitted? If so, please give the title and inventors: NO

**PLEASE READ AND FOLLOW THE DIRECTIONS ON
HOW TO WRITE A DESCRIPTION OF YOUR INVENTION**

Try to limit your description to 2-3 pages
Do NOT attach a presentation, white paper, or specification
ANSWER ALL OF THE QUESTIONS BELOW

Please provide a description of the invention and include the following information:

1. Describe in detail what the components of the invention are and how the invention works.

This invention, the Content/Context-Sensitive Acceleration Framework, will dynamically optimize web services or others distributed transactions, taking into consideration the following:

1. The static as well as time-varying characteristics of each node in the message path;
2. The characteristics of the content/data and the application; and
3. Any empirical data on the performance trade-offs for the particular transaction.

That is, it will be an end-to-end performance optimizing framework which leverages the unique performance-enhancing capabilities of Intel's 4 architectures together.

Here are the steps in its working:

The resources (or platforms including web service consumers, intermediary devices, wireless network gateways and web service producers) have self-describing configuration and current state information parameters (e.g., intrinsic capabilities that are static, CPU utilization, memory available, battery level, and so on). The Content/Context-Sensitive Acceleration Framework utilizes such parameters to determine the device's unique capabilities and/or limitations (e.g., whether floating point arithmetic is implemented in hardware or if it is implemented as a software emulation (as in SA-1100), and whether TCP processing could be off-loaded to an additional processor (as in our IXA devices).

The Content/Context-Sensitive Acceleration Framework will also utilize messaging and processing requirements of a given transaction based on the application and the content/data characteristics (e.g., string-manipulation intensive, and so on). These requirements can be derived at runtime, from historic data or via development time meta-data.

This framework will then compare the needs of a given transaction message and the capabilities/limitations of the message path node to determine the best means to process the given message on that device.

Examples of such performance optimizing decisions may include:

- o Caching or offloading a particular application module or data (based on the processing capabilities of the client and the server, network bandwidth available, client/server CPU utilization, past data);
- o Utilizing an Intel Performance Primitive (IPP) Library for an appropriate task;
- o Utilizing an additional off-load processing capability via local installed hardware; and
- o Utilizing an additional off-load processing capability via network infrastructure resources when capability is not resident on a given device

- ~~o An additional layer of web services aware algorithm that accelerate the processing of SOAP packages on top of IPP library~~
- ~~o This addition layer will be optimized to handle most frequently used web services operations (SOAP serialization, deserialization, deep packet inspection, etc.) to differentiate web services performance on IA~~
- ~~o This invention will also be able to extend the web service acceleration features to ETA architecture and land on Intel hardware and hence extend to beyond server platform to IA PC, mobile and network building blocks~~

2. Describe advantage(s) of your invention over what is currently being done.

Current approaches to performance optimization	Proposed approach
<u>Mostly static</u>	<u>Dynamic</u>
<u>Consider only local resources (local optima)</u>	<u>Consider end-to-end resources (global optima)</u>
<u>Superficial or no application knowledge</u>	<u>Deep application knowledge</u>
<u>Do not consider empirical data</u>	<u>Considers empirical data</u>

EXHIBIT 1

Currently, content being transmitted between distributed resources is processed in a generic and static fashion. The current optimizations are simplistic. For example, they tailor content to the display/audio capabilities of hand-helds or they dim the display in case of low battery levels. However, in many cases, optimizations require much more involved reasoning about the nature of the application, content/data, and the platforms.

The processing of SOAP messages over HTTP/TCP provides a good example of the situation. Message payload experiments have shown that under small message payload scenarios, network-processing latency is the bottleneck. When SOAP messages reach a particular size, then the bottleneck moves from the network protocol processing to the SOAP/XML operations. Also, XML payload's content makes big differences. For example, if it consists of large arrays of floats, the hardware support for floating point operations becomes important.

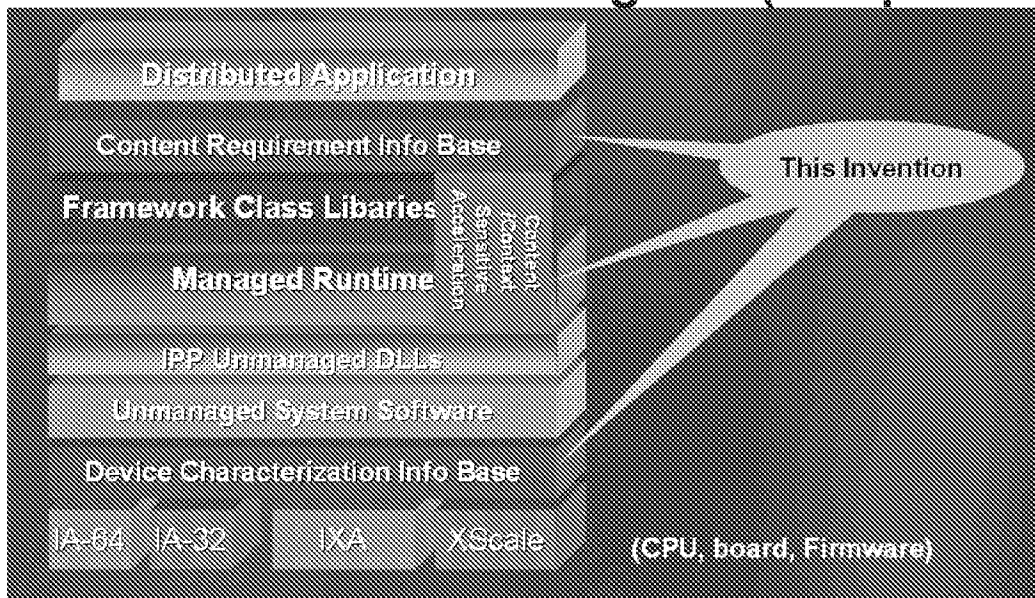
Again, platforms and their capabilities need to be considered at a much deeper level than is being done today. For example, when an operation is floating point processing intensive, off-loading to a server provides faster response even when the network latency is high when the client runs a SA-1100 processor (which has only software emulation of FP processing). On the other hand, with clients running other processors, the results vary.

With a large number of interacting parameters and incomplete characterization, it is not always possible to make the right processing decisions from first principles. Hence, empirical data is important. Our approach is the first one we are aware of that includes the use of empirical data in making performance optimization decisions.

Hence, the static and localized processing optimizations of the current approaches will fail as the performance bottlenecks dynamically changes given the network transmission at hand. This invention provides a means to select the Intel processing capability dynamically depending on the needs of specific applications and content/data.

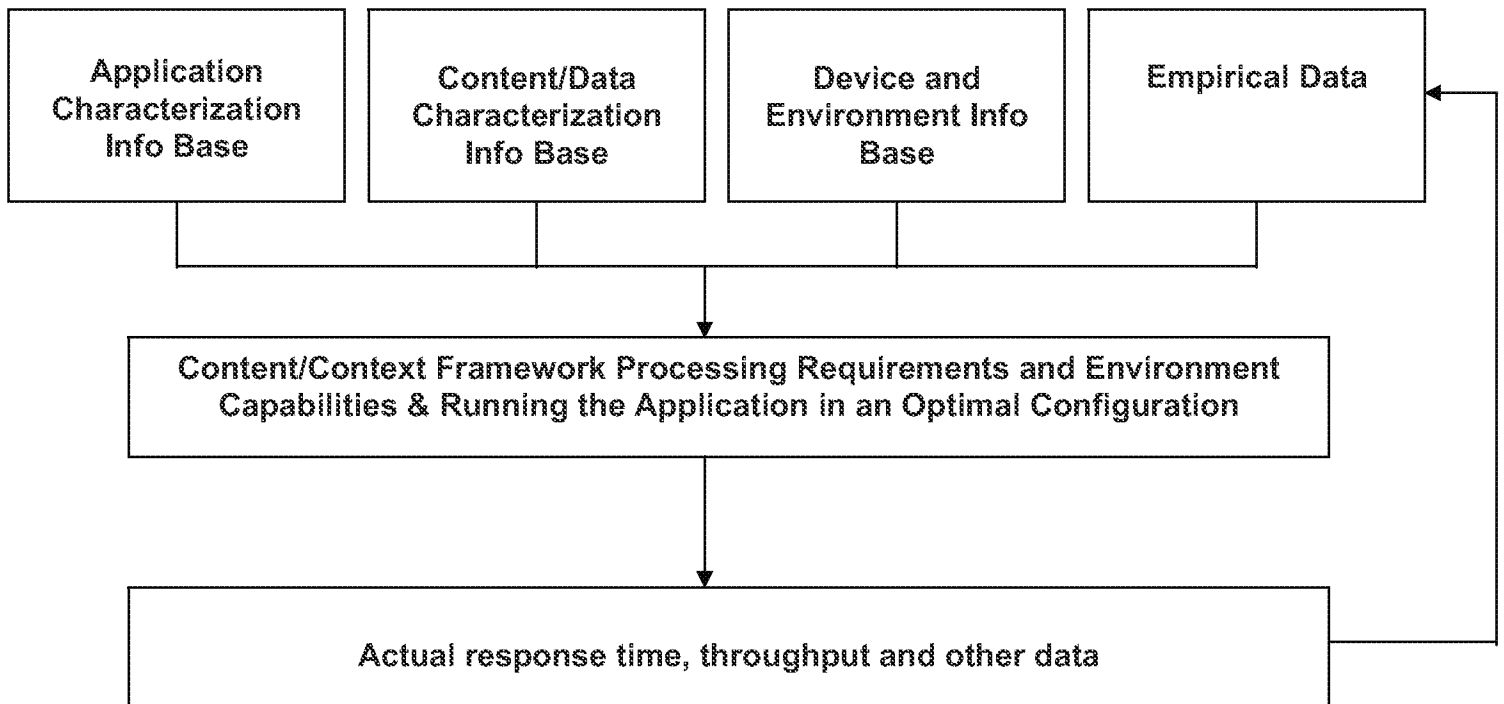
3. You MUST include at least one figure illustrating the invention. If the invention relates to software, include a flowchart or pseudo-code representation of the algorithm.

Architectural Stack Diagram (footprint of the invention)



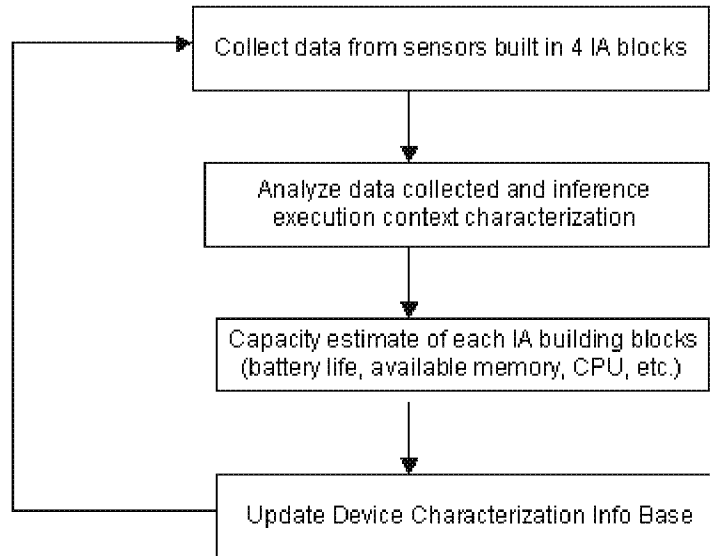
* This invention may place additional Device/Platform characterization attributes within the Device Characterization Info Base stack layer

Invention Components & Dataflow



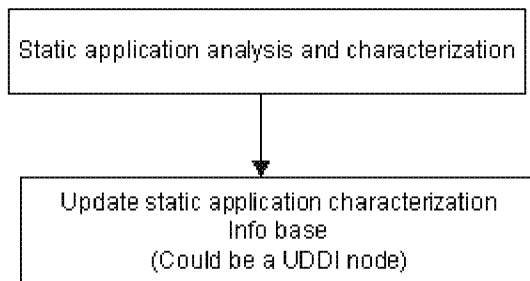
Process Flow Diagrams

Device Characterization Services

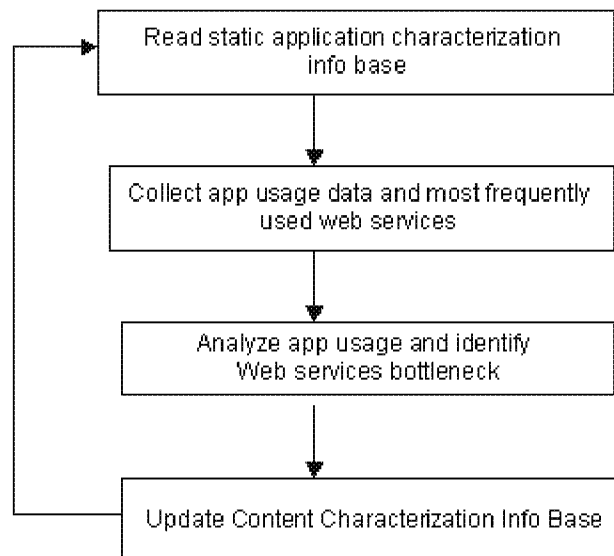


Content Characterization Services

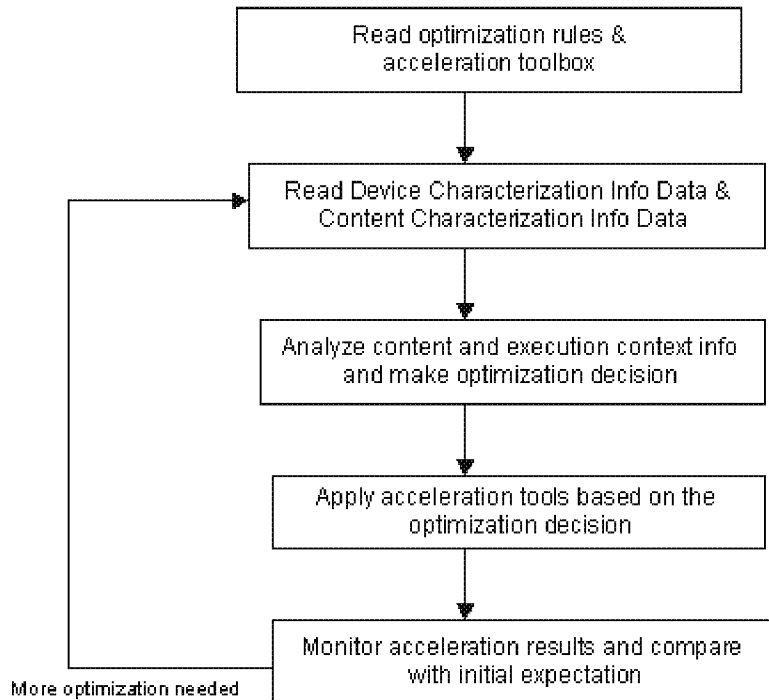
Static App Analysis



Dynamic App Analysis



Context/Content Sensitive Acceleration



~~(Need a lot more work in this section)~~

4. Value of your invention to Intel (how will it be used?).
(Srin please add)

~~Intel is a provider of platforms end-to-end.~~ We have made significant investments in providing means for monitoring and changing the platform behavior (e.g., CIM+, CC/PP). However, we constantly face the challenge in translating the platform (e.g., server) manageability into service manageability that is sensitive to the needs of specific applications. This invention will help to weave the myriad of management features on our multiple platforms into a useful capability for the end user (i.e., it helps the users easily realize the value we have put in the platform).

Specifically, in its first embodiment, this invention will ~~add web services to the core of Intel products and differentiate IA platforms when it comes to web services~~ distributed XML processing with either text or media content (~~Currently there are some XML acceleration exists today,~~ but it is static and does not use deep knowledge of platform and content uniqueness).

How will it be used by Intel?

We will create an embodiment of this framework to address the needs to web services and consider the capabilities of IA blade servers, XScale and Banias clients and IXA/Tarari network devices. EPG's IO&Management Architecture group and the AIMM software group is interested in getting large management vendors such as CA, IBM and HP to implement this capability in their product.

Similarly, WCCG is interested in demonstrating the usefulness of the CC/PP framework to deliver reduced response times end-to-end and enabling the ISVs to build it into their middleware products.

5. Explain how your invention is novel. If the technology itself is not new, explain what makes it different.

- The currently available performance management capabilities do not use a "deep knowledge" of applications, data/content and platforms. They are limited to simplistic decisions such as reducing the brightness of the

display when the battery is low. The proposed framework will use a deeper knowledge of application and data/content (such as data types, cryptographic algorithms, and so on) as well as the platform to make optimization decisions.

- Current optimizations are usually done per platform. The proposed framework will optimize based on end-to-end criteria such as the response time for the end-user.
- So many factors are involved in making an end-to-end optimization that it is not always possible to do it from the first principles. Hence, we will use empirical data to make some decisions. This is a novel idea that is not part of any of the commercial products.

Please see the answer to question 2 above for additional distinctions of the proposed technology.

6. Identify the closest or most pertinent prior art that you are aware of.

The current capabilities on our mobile platforms to react to battery-level change are limited to actions such as reducing the display brightness. They are also optimizing only for the mobile platform.

eXML-acceleration on special hardware is not a dynamic optimization framework. For example, even when the server is idle, the special hardware will continue to handle the XML parsing work.

The research framework, Spectra, developed in CMU makes decisions on off-loading processing to a server, but is limited in its objectives and criteria considered and does not use empirical data.

7. Who is likely to want to use this invention or infringe the patent if one is obtained and how would infringement be detected?

Management tool vendors such as CA, IBM and HP.

Use of some unique abilities in the proposed framework such as the use of empirical data will help in detection of infringement.

**HAVE YOUR SUPERVISOR READ AND FORWARD IT ELECTRONICALLY
VIA E-MAIL TO "INVENTION DISCLOSURE SUBMISSION"**

DATE: 10/11/02_____ SUPERVISOR: Norbert Mikula_____

BY APPROVING, I (SUPERVISOR) ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS
DISCLOSURE, AND RECOMMEND THAT THE HONORARIUM BE PAID